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TITLE: Cytotoxicity of in vitro exposure of polystyrene latex bead nanoparticles to human keratinocyte (HaCaT) cells and human cervical cancer (HeLa)cells

PRESENTATION TYPE: General Communication

CURRENT SPECIAL INTEREST GROUP: Epithelia & Membrane Transport

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ABSTRACT BODY:

Abstract Body : Nanoparticles are increasingly used in industry and medicine due to their unique physiochemical properties such as their small size, charge, shape, chemical architecture, large surface area, surface reactivity and media interactions, etc [1-5]. However, very little is still known on the interactions between nanoparticles and the biological system. This study aims to evaluate the cytotoxicity of polystyrene latex bead nanoparticles on HaCat and HeLa cell lines. Carboxyl-modified 20 nm polystyrene NPs core labelled with fluorophore were from Invitogen. We chose to use polystyrene NPs because this specific type of NP is being increasingly characterized for use in nanosensors and drug nanocarrier investigations. 1x 10^4 cells/100 µl of cell culture medium were plated into 96-well plates in triplicate, measuring activity post 24 hours at concentrations of 10, 50, 100 µg/ml of polystyrene NPs exposure. The extracellular lactate dehydrogenase release was measured by using a colorimetric CytoTox 96 nonradioactive assay kit from Promega and the absorbance were recorded at 450nm (FLUO-star) with Elisa micro plate reader. The MTT assay was used to evaluate mitochondrial activity. This was performed by inserting a premixed optimized dye solution in the culture wells. The Absorbance was recorded at 570 nm, from the recorded absorbance is directly proportional to the number of live cells. The cell lines were kept in a plastic T-75cm^2 tissue culture flasks grown in DMEM.

We found that cytotoxicity of polystyrene NPs on both cells was concentration dependent. For Hela cells, with exporesure of polystyrene NPs at concentrations of 10, 50, 100 µg/ml for 24 hrs, the percentage cytotoxicity of positive control for LDH assay was 35.9%, 49.5% and 73.4% respectively. With the MTT cell viability assay the percentage MTT reduction of negative control was 88.9%, 42.9% and 26.4% respectively. Cell toxicity increased with increasing polystyrene NPs concentration. For HaCaT cells, the cytotoxic effect is less significant than those on Hela cells. With MTT assay, when compared to HaCaT cells exposed to a negative control containing only PBS, the cell viability decreased as the concentrations of NPs increased. Cells exposed to 100µg/ml of polystyrene NPs for a period of 24 hours compared to those exposed to a positive control (100% cell viability) had an average cell viability of 49%, with those numbers decreasing from 59% for cells exposed to 10µg/ml of polystyrene NPs to 57% for cells exposed to 50µg/ml of polystyrene NPs.

Our results indicated that polystyrene NPs acted differently in two different cell types and that cautions should be taken about its cytotoxicity. Further understanding of the mechanism involving the ROS generation could provide more information on how polystyrene NPs increase cytotoxicity.

Acknowledgements: RP, MZ contribute equally

Reference 1: Jiang et al, 2008, Nature Nanotechnology, 3:145-150

Reference 2: Albanese, et al, 2012, Annual Review of Biomedical Engineering, 14:1-16

Reference 3: McCarthy, et al, 2011, International Journal of Nanomedicine, 6:1343-1356

Reference 4: Xia, et al, 2006, Nano Letters, 6:1794-1807

Reference 5: Kumar et al, 2012, Rev Environ Contam Toxicol, 215:39-121

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